REMARKS

Independent claim 5 has been amended to include limitations similar to the limitations of cancelled claims 6 to 9. Independent claim 19 has been amended to include limitations that are similar to cancelled claims 21 and 26.

As do claims 5 and 19, independent claim 28 has been amended to require a cooling fluid passage in which water or steam flows through tubes forming walls for a boiler and a separate combustion cavity, from the tubes in the cavity to a superheater in the boiler and to a superheater in the cavity. The combustion gases in the cavity flow downward over the cavity superheater and mix with the flue gases in the boiler at an elevation below the superheater in the boiler. These features are not disclosed or suggested by the combination prior applied in the rejections.

The rejections of cancelled claims 32 and 34 are moot. Further, independent claim 28 has been amended to avoid concerns raised in the rejections of claims 32 and 34 relating to mixing in a narrow section of the furnace flue gas passage the combustion gases from the cavity.

The rejection of claims 5, 7 to 9[1] and 19 to 27 as being obvious over WO 92/18690 (WO '690) in view of Hamm (US Pat. 2,606,103) and Engstrom (US Pat. 4,676,177) has been overcome by amendment and is traversed.

WO '690 does not show water and steam flowing first through cooling tubes that form a wall of a first boiler (18) and of wall a second boiler (22) and then flowing to the

[1] Claims 7 to 9 are cancelled.

superheater (51) in the first boiler. Further WO '690 does not shows combustion gases in the second boiler flowing downward over a superheater in the second boiler, entering the first boiler and then flowing upward to the superheater in the first boiler.

WO '690 does not disclose walls of a cavity that are: (1) cooled with the same water circulating through the walls of the boiler or (2) having water cooling tubes that are at least partially formed of the walls of the boiler. There is no suggestion in WO '690 that the walls of the boiler and waste liquor recovery boiler share water cooled tubes or water cooled walls.

The Action at page 4 describes WO '690 as disclosing "walls of the boiler further comprising a plurality of water cooled tubes in fluid communication with the water or steam circulation system." Contrary to the Action, WO '690 at page 13, lines 27 to 30 states that the separate superheating boiler and the waste liquor recovery boiler may have "pressure frames [that] are closely connected to each other, for instance by some kind of precombustion chamber construction." WO '690 does not disclose water cooled walls of the waste liquor recovery boiler that are in fluid communication with the walls of the superheating boiler.

WO '690 discloses combustion gases from a second boiler that enter a first boiler at the same elevation as the superheater in the first boiler. The arrow in the one figure (between reference numerals 74 and 51) of WO '690 shows that the gases from the second boiler enter the first boiler at the same elevation as the superheater in the first boiler. The hot combustion gases from the second boiler in WO '690 do not pass over the

entirety of the superheater in the first boiler. WO '690 does not teach that gases from the second boiler are to be discharged immediately upstream of the superheater of the first boiler or opposite to a bullnose section of a rear wall of the first boiler.

In the claimed invention, the combustion gases in the cavity flow downward, over the superheater in the cavity, and through an outlet to the flue gas passage of the boiler. Because of the downward flow of gases in the cavity, the outlet from the cavity to the boiler is below and immediately upstream of the superheaters in the boiler. This relatively low cavity position (as compared to WO '690) allows combustion gases from the cavity to pass over the entirety of the superheaters in the boiler.

Directing hot gases downward is counter to the normal upward flow of hot gases and thus is counterintuitive. The advantage of the downward flow of hot gases in the cavity is that the gases from the cavity flow into the furnace upstream (below) the superheaters. In contrast, WO'690 shows an upward flow of hot combustion gases in a cavity and the gases from the cavity flowing into the furnace at the same elevation as the superheaters. The lower portions of the superheaters in the furnace do not receive the combustion gases from the cavity in WO '690.

The reference in WO '690 (page 13, lns. 26-30) to "closely connected" pressure frames for the "separate" superheating boiler and the waste liquor recovery boiler is not a teaching that the walls of both boilers are cooled with the same water circulation system. In particular, WO '690 does not state that the walls of the cavity are cooling tubes in fluid communication with water cooled walls of a boiler. Further, it is not inherent that the

walls of the superheating boiler in WO '690 are water cooled with water from water cooled walls of the boiler. Assuming that the superheating boiler of WO '690 has water cooled walls, there is no reason to believe that the cooling water for the walls of the superheater is hot water flowing from the water cooled walls of the boiler.

The superheating surfaces 72 in WO '690 are not cooling tubes forming the walls of the superheating boiler. The disclosure in WO '690 (page 16, lns. 6-14) of superheating surfaces 72 states that such surfaces are "disposed in the superheating boiler" and does not state that the surfaces constitutes the walls of the boiler. The superheating surfaces 72 may be disposed within the superheating boiler and not form the walls of the boiler. By way of example, the present application discloses a superheater 24 (IV) that is distinct from the water cooled walls of the superheating cavity. Accordingly, the disclosure of a superheating boiler in WO '690 is not a suggestion that the walls of the superheating boiler are water cooled with water flowing from water cooled walls of the boiler.

The recovery furnace A, shown in Figure 2 of Hamm, does not have a superheater and cannot constitute a "cavity" as is recited in the claims. Hamm teaches away from water cooled tubes in a second furnace with a superheater. Hamm shows a furnace (D) with a superheater (10) connected by pipe 28 to a superheater of the furnace C. The walls of furnace D are made of refractory material and cooled by air. Hamm, column 5, lines 60- column 6, line 3. This separate furnace D does not have water cooled tube walls. The lack of water cooled walls in Hamm would have lead a person of ordinary skill away

from the claimed invention that involves water cooled walls and coupling of water cooled walls in a cavity and in a furnace.

Contrary to the rejection, tubes 16, 17, 27 and 10 in Hamm are not water cooled walls. Tubes 16, 17, 27 and 10 form the super heaters in the second furnace D and recovery furnace. Hamm, col. 5, lns. 40-45. These tubes are not walls and the second furnace D does not have water cooled walls. Thus, Hamm does not show fluid communication between water cooled walls of the first and second furnaces. Further, Hamm does not show a common wall between the superheater furnace D and the recovery furnace A. Ham shows a horizontal flue duct 11 extending from furnace D and openings in the side wall of the recovery furnace A (col. 5, lines 5 to 23) through which the flue gases from furnace D can flow to the recovery furnace A. The horizontal flue duct 11 in Ham is inconsistent with common wall between a cavity and a boiler.

Engstrom discloses a method for producing energy from low-grade alkali fuels in a gasifier-combustor system. The Engstrom combustor (4) is a slagging boiler having one combustor chamber for burning the gas from the gasifier. The boiler (4) has no chamber or cavity for additional fuel. The wall of Engstrom divides the lower part of the boiler 4 so that a combustion chamber (13) and a flue gas duct for recovering heat from the gas are formed. The wall forms a sharp turn in the gas flow to remove molten solids from the flue gas stream via a slag tap at the bottom of the boiler. Engstrom (col. 1, line 20-25) recognizes that burning low-grade fuel may result in the fouling and slagging of heat transfer surfaces. Engstrom teaches that melt and solid ash should be removed before the

gas flows to the convection section (14) of the boiler. By teaching the removal products of combustion before flue gas reaches the convention section, Engstrom teaches away from a combustion cavity to burn additional fuel that generates new combustion gases separately from the burning of the main fuel (spent liquor) and injected just upstream of the convention section.

Engstrom has one combustion chamber (furnace) in which the product gas from the gasifier 1 is burned in a combustion chamber 13 of the boiler 4 at oxidizing conditions. Melt and solid ash are drained through the bottom of the boiler and collected. The flue gases pass through a convection section 14 of the boiler, in which heat energy is recovered in the form of steam. A major fraction of the molten solids is removed from the flue gas stream by the sharp turn in gas flow, via the slag tap at the bottom of the boiler. Engstrom does not suggest and is unrelated to an "additional" combustion chamber arranged in the recovery boiler.

The combination of WO '690 and Engstrom do not form the claimed invention. In particular, there is no disclosure in WO '690, Hamm and Engstrom of water cooled walls in a cavity that are formed of water cooled walls in a furnace or of such walls being in fluid communication.

The Action states that "applicant is using the known technique of providing a common wall between the combustion chamber and the boiler to improve similar devices in the same way." This statement does not address the requirement of the claims that the walls of the boiler and the walls of the cavity be in "fluid communication." In view of the

lack of such a disclosure it WO '690 and Engstrom, the combination of the references could not have lead a person of ordinary skill in the art to arrange walls between a combustion chamber and a boiler that are in fluid communication.

The combination of Hamm and Engstrom would not have lead a person of ordinary skill to use water cooled walls, because these references do not teach the use of water cooled walls in fluid communication. Hamm teaches away from water cooled walls. Engstrom is largely silent regarding water cooled walls. These references do not provide a suggestion to a person of ordinary skill to arrange water cooled walls that are in fluid communication.

The rejection of claim 5, 10 to 12, 14, 15 and 18 as being obvious over Hamm in view of Engstrom has been overcome by amendment is traversed for the reasons stated above.

Hamm and Engstrom do not disclose or suggest the cooling fluid flow recited in the claims of fluid passing through water cooled tubes forming a wall of a boiler and a wall of a combustion cavity, to a superheater in the boiler and then to a superheater in the cavity.

The rejection of claim 28 for obviousness over WO '690 in view of Olausson (US Pat. 5,454,908) has been overcome by amendment and is traversed for the reasons stated above with respect to WO '690.

Olausson describes a method for obtaining fumes having a low content of nitrogen oxides during the combustion of black liquor in recovery boilers. In this method a part of

the combustion air is fed as a last portion at a very highly located level so that a reducing atmosphere without extra addition of reduction gases exists from the area of the input of the black liquor to the last air addition for a period of at least 3-5 seconds. Olausson does not teach selective non-catalytic reduction (SNCR) or improving mixing by adding a flue gas stream at a certain location in the furnace of the recovery boiler.

WO '690 and Olausson do not in combination disclose or suggest the cooling fluid flow recited in the claims of fluid passing through water cooled tubes forming a wall of a boiler and a wall of a combustion cavity, to a superheater in the boiler and then to a superheater in the cavity.

The rejection of claims 28 for obviousness over Hamm in view of Olausson has been overcome by amendment and is traversed for the reasons stated above.

Hamm and Olausson do not in combination disclose or suggest the cooling fluid flow recited in the claims of fluid passing through water cooled tubes forming a wall of a boiler and a wall of a combustion cavity, to a superheater in the boiler and then to a superheater in the cavity.

All claims are in good condition for allowance. If any small matter remains outstanding, the Examiner is requested to telephone applicants' attorney. Prompt reconsideration and allowance of this application is requested.

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed

herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /Jeffry H. Nelson/
Jeffry H. Nelson
Reg. No. 30,481

JHN:glf
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100